

THAT WHICH IS CLAIMED:

1. An antenna, comprising:
a ground plane;
a conductor loop overlying the ground plane; and
a monopole extending off the ground plane,
5 wherein the monopole and the conductor loop are configured to be coupled to
a common feedpoint.
2. An antenna according to Claim 1, wherein the conductor loop has a
reflective feature therein.
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3. An antenna according to Claim 2, wherein the reflective feature
comprises a corner.
4. An antenna according to Claim 3, wherein the conductor loop is
15 rectangular.
5. An antenna according to Claim 4, wherein the conductor loop is
substantially parallel to the ground plane.
- 20 6. An antenna according to Claim 4, wherein the monopole is
substantially parallel to the conductor loop.
7. An antenna according to Claim 4, wherein the monopole is coupled to
the conductor loop at a corner thereof.
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8. An antenna according to Claim 4, wherein the ground plane, the
conductor loop and the monopole are configured to provide a voltage standing wave
ratio (VSWR) less than about 3 over a frequency range from about 1.5 GHz to about
2.5 GHz.
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9. An antenna according to Claim 4, wherein the conductor loop is positioned adjacent an edge of the ground plane, and wherein the monopole extends off the edge of the ground plane.
- 5 10. An antenna according to Claim 4, wherein the ground plane comprises a conductive layer on a printed circuit substrate.
11. An antenna according to Claim 10, wherein the common feedpoint comprises a pad on the printed circuit substrate.
- 10 12. An antenna according to Claim 4, further comprising a helical element arranged coaxial with the monopole and configured to be coupled to the common feedpoint.
- 15 13. An antenna according to Claim 12, wherein the ground plane, the conductor loop, the monopole and the helical element are configured to provide a voltage standing wave ratio (VSWR) less than about 3 over a frequency range from about 1.5 GHz to about 2.5 GHz and a VSWR less than 3 over a frequency range from about 800 MHz to about 900 MHz.
- 20 14. An antenna according to Claim 12, wherein the monopole comprises a retractable monopole configured to extend and retract through the helical element and configured to connect to the common feedpoint in an extended position.
- 25 15. An antenna according to Claim 14, wherein the helical element is configured to disconnect from the common feedpoint when the retractable monopole is in the extended position and configured to connect to the common feedpoint to the common feedpoint when the retractable monopole is in a retracted position.
- 30 16. An antenna according to Claim 4:
wherein the ground plane comprises a rectangular ground plane;
wherein the conductor loop comprises a rectangular conductor loop having a side substantially aligned with a shorter side of the rectangular ground plane;

wherein the monopole comprises a substantially linear conductor that extends substantially perpendicular to the edge of the ground plane from a coupling point at a corner of the rectangular conductor loop at the edge of the ground plane.

5 17. An antenna according to Claim 16:

 wherein the conductor loop has dimensions of about 18 mm by about 8 mm, has a longer side thereof substantially aligned with the edge of the ground plane, and is separated from the ground plane by a distance in a frequency range from about 5 mm to about 10 mm; and

10 wherein the monopole has a length of about 36 mm.

 18. An antenna according to Claim 17, wherein the ground plane comprises a substantially rectangular ground plane having a length greater than about 110 mm and a width greater than about 40 mm.

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 19. An antenna according to Claim 1, further comprising a helical element wrapped around the monopole and coupled to the common feedpoint.

 20. A radio communications device, comprising:
20 a frame;

 a radio communications circuit supported by the frame;

 a conductive ground plane disposed on a substrate supported by the frame;

 a conductor loop supported by the frame and overlying the ground plane; and

 a monopole supported by the frame and extending off the ground plane,

25 wherein the monopole and the conductor loop are configured to be commonly coupled to the radio communications circuit at a common feedpoint.

 21. A device according to Claim 20, wherein the conductor loop has a reflective feature therein.

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 22. A device according to Claim 21, wherein the reflective feature comprises a corner.

23. A device according to Claim 22, wherein the conductor loop is rectangular.

24. A device according to Claim 23, wherein the conductor loop is
5 substantially parallel to the ground plane.

25. A device according to Claim 23, wherein the monopole is substantially parallel to the conductor loop.

10 26. A device according to Claim 23, wherein the monopole is coupled to the conductor loop at a corner thereof.

27. A device according to Claim 23, wherein the ground plane, the conductor loop and the monopole are configured to provide a voltage standing wave
15 ratio (VSWR) less than about 3 over a frequency range from about 1.5 GHz to about 2.5 GHz.

28. A device according to Claim 23, wherein the conductor loop is positioned adjacent an edge of the ground plane, and wherein the monopole extends
20 off the edge of the ground plane.

29. A device according to Claim 23, wherein the ground plane is disposed on a printed circuit substrate, and wherein the common feedpoint comprises a pad on a printed circuit substrate.

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30. A device according to Claim 23, further comprising a helical element arranged coaxial with the monopole and coupled to the common feedpoint.

31. A device according to Claim 30, wherein the ground plane, the
30 conductor loop, the monopole and the helical element are configured to provide a voltage standing wave ratio (VSWR) less than about 3 over a frequency range from about 1.5 GHz to about 2.5 GHz and a VSWR less than 3 over a frequency range from about 800 MHz to about 900 MHz.

32. A device according to Claim 30:
wherein the ground plane comprises a rectangular ground plane;
wherein the conductor loop comprises a rectangular conductor loop having a side substantially aligned with a shorter side of the rectangular ground plane; and
5 wherein the monopole comprises a substantially linear conductor that extends substantially perpendicular to the edge of the ground plane from a coupling point at a corner of the rectangular conductor loop at the edge of the ground plane.
33. A device according to Claim 32:
10 wherein the conductor loop has dimensions of about 18 mm by about 8 mm, has a longer side thereof substantially aligned with the edge of the ground plane, and is separated from the ground plane by a distance in a frequency range from about 5 mm to about 10 mm; and
wherein the monopole has a length of about 36 mm.
- 15 34. A device according to Claim 32, wherein the ground plane comprises a substantially rectangular ground plane having a length greater than about 110 mm and a width greater than about 40 mm.
- 20 35. A device according to Claim 30, wherein the frame comprises a clamshell housing having first and second rotatably attached portions, wherein the ground plane comprises substrate comprises electrically coupled first and second portions disposed in respective ones of the first and second housing portions.
- 25 36. A device according to Claim 35, wherein the first and second housing portions are mechanically joined by a hinge, and wherein the monopole and the helical element are positioned between the first and second housing portions and are aligned substantially parallel to an axis of rotation of the hinge.
- 30 37. A device according to Claim 35, wherein the monopole comprises a retractable monopole configured to extend and retract through the helical element and configured to connect to the common feedpoint in an extended position.

38. A device according to Claim 37, wherein the helical element is configured to disconnect from the common feedpoint when the retractable monopole is in the extended position and configured to connect to the common feedpoint to the common feedpoint when the retractable monopole is in a retracted position.

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39. A mobile terminal, comprising:
a frame;
a radio communications circuit supported by the frame;
an antenna electrically coupled to the radio communications circuit, attached
10 to the frame and comprising commonly fed conductor loop, monopole and helical elements.

40. A mobile terminal according to Claim 39, wherein the conductor loop element has a reflective feature therein.

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41. A mobile terminal according to Claim 40, wherein the conductor loop element comprises a rectangular conductor loop.

42. A mobile terminal according to Claim 39, further comprising a ground
20 plane supported by the frame, and wherein the conductor loop element is positioned overlying the ground plane.

43. A mobile terminal according to Claim 42, wherein the ground plane, the conductor loop element, the monopole element and the helical element are
25 configured to provide a voltage standing wave ratio (VSWR) less than about 3 over a frequency range from about 1.5 GHz to about 2.5 GHz and a VSWR less than 3 over a frequency range from about 800 MHz to about 900MHz.